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IEEE C57.12.26-1992
(Revision of ANSI C57.12.26-1987)

IEEE Standard for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers for Use With Separable Insulated High-Voltage Connectors (34 500 Grd Y/19 920 V and Below; 2500 kVA and Smaller)

Sponsor
Transformers Committee of the
of the
IEEE Power Engineering Society

Approved June 18, 1992
IEEE Standards Board

Approved June 9, 1993
American National Standards Institute

Abstract: This standard is intended for use as a basis for determining performance, interchangeability, and safety of the equipment covered, and for assisting in the proper selection of equipment. It covers certain electrical, dimensional, and mechanical characteristics and takes into consideration certain safety features of three-phase, 60 Hz, mineral-oil-immersed, self-cooled, pad-mounted, compartmental-type distribution transformers with separable insulated high-voltage connectors. These transformers are rated at 2500 kVA and smaller, with high voltages of 34 500 Grd Y/19 920 V and below and with low voltages of 480 V and below. These transformers are used generally for step-down purposes from an underground primary cable supply. Connector and terminal arrangements for both radial-feed and loop-feed systems are included.

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Foreword

(This foreword is not a part of IEEE C57.12.26, IEEE C57.12.26-1992, IEEE Standard for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers for Use With Separable Insulated High-Voltage Connectors.)

The Accredited Standards Committee on Transformers, Regulators, and Reactors, C57, has for many years been developing standards on transformers, regulators, and reactors. The data has been obtained from many sources, including the standards of the Institute of Electrical and Electronics Engineers (IEEE) and the National Electrical Manufacturers Association (NEMA), reports of committees of the Edison Electrical Institute, and others.

This standard was prepared by the Working Group of the Subcommittee on Distribution Transformers, Overhead and Padmounted C57.12.2, and is a revision of the 1987 edition. Significant additions to this edition are the percent impedance voltage for transformers below 750 kVA, a drain value requirement, and additional sections on storage and installation.

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IEEE Standard for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers for Use With Separable Insulated High-Voltage Connectors (34 500 Grd Y/19 920 V and Below; 2500 kVA and Smaller)

1. Purpose and Scope

1.1 Purpose

This standard is intended for use as a basis for determining the performance, interchangeability, and safety of the equipment covered, and for assisting in the proper selection of such equipment.

1.2 Scope

This standard covers certain electrical, dimensional, and mechanical characteristics and takes into consideration certain safety features of three-phase, 60 Hz, mineral-oil-immersed, self-cooled, pad-mounted, compartmental-type distribution transformers with separable insulated high-voltage connectors. These transformers are rated 2500 kVA and smaller, with high voltages of 34 500 Grd Y/19 920 V and below and with low voltages of 480 V and below. These transformers are used generally for step-down purposes from an underground primary cable supply.

NOTE — Refer to latest Federal regulations concerning polychlorinated biphenyl (PCB) contamination in transformers.

This standard covers connector and terminal arrangements for both radial-feed and loop-feed systems. Either certain minimum dimensions (see Figs 1-4) or certain specific dimensions (see Figs 5.A-8) shall be specified.

This standard does not cover the electrical and mechanical requirements of any accessory devices that may be supplied with the transformer.

2. References

All characteristics, definitions, terminology, voltage designations, and tests, except as otherwise specified herein, shall be in accordance with the following standards. When the standards listed here are superseded by an approved revision, the latest revision shall apply.

[1] ANSI C57.12.28-1988, American National Standard for Switchgear and Transformers Pad-Mounted Equipment — Enclosure Integrity.[1]

[2] ANSI C57.12.70-1978 (Reaff 1987), American National Standard for Terminal Markings and Connections for Distribution and Power Transformers.

[3] IEEE C57.12.00-1987, IEEE Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers (ANSI).[2]

[4] IEEE C57.12.80-1978 (Reaff 1986), IEEE Standard Terminology for Power and Distribution Transformers (ANSI).

[5] IEEE C57.12.90-1987, IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and Guide for Short-Circuit Testing of Distribution and Power Transformers (ANSI).

[6] IEEE C57.91-1981 (Reaff 1991), IEEE Guide for Loading Mineral-Oil-Immersed Overhead and Pad-Mounted Distribution Transformers Rated 500 kVA and Less With 65 °C or 55 °C Average Winding Rise (ANSI).

[7] IEEE C57.92-1981 (Reaff 1991), IEEE Guide for Loading Mineral-Oil-Immersed Power Transformers up to and Including 100 MVA With 55 °C or 65 °C Winding Rise (ANSI).

[8] IEEE Std 386-1985 (Reaff 1991), IEEE Standard for Separable Insulated Connectors for Power Distribution Systems Above 600 V(ANSI, DoD).

3. Ratings

3.1 Kilovolt-Ampere Ratings

Kilovolt-ampere (kVA) ratings are continuous and are based on not exceeding either a 65°C average winding temperature rise or an 80°C hot-spot conductor temperature rise. The temperature rise of the insulating oil shall not exceed 65°C when measured near the top of the tank. These kVA ratings are based on the temperature and service conditions specified in IEEE C57.12.00-1987 [3]. The kVA ratings shall be as follows:

[1]ANSI publications are available from the Sales Department, American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036, USA.
[2]IEEE publications are available from the Institute of Electrical and Electronics Engineers, Service Center, 445 Hoes Lane, P. O. Box 1331, Piscataway, NJ 08855-1331, USA.

75	500
112.5	750
150	1000
225	1500
300	2000
	2500

3.2 Voltage Ratings

Voltage Ratings shall be in accordance with Table 1.

Table 1—Range of kVA and Voltage Ratings

	kVA Ratings	
High-Voltage Ratings (V)	**Low-Voltage Ratings (V) 208Y/120, 240**	**Low-Voltages Ratings (V) 480Y/277, 480**
Delta or wye		
2400	75–750	75–750
4160	75–1000	75–1000
4800	75–1000	75–1500
7200	75–1000	75–2000
12 000, 12 470	75–1000	75–2500
13 2000, 13 800, 16 340	75–1000	75–2500
Grounded wye		
22 860, 23 900, 24 940	75–1000	75–2500
34 500	75–1000	75–2500

NOTES:
1 — Kilovolt-ampere ratings that are separated by a dash indicate that all intervening ratings covered in this standard are included.

2 — Unsymmetrical loading of wye-wye connected units may cause heating of their tanks in excess of that which would be produced by balanced conditions. To reduce the probability of tank heating, such units shall be provided with a core construction that will not saturate when 33% zero sequence voltage is applied.

3 — For complete connector ratings, see IEEE Std 386-1985 [8].

3.3 Tap Ratings

Voltage taps shall be as given in Table 2. The tap changer handle in the terminating compartment shall be marked for deenergized operation.

Table 2—High-Voltage Taps

		High-Voltage Taps			
		75–500 kVA			
		Low-Voltage Ratings 208Y/120 (V)	Low-Voltage Ratings 240, 480Y/277, 480 (V)		
High-Voltage Ratings (V)	BIL (kV)	Below	Above	Below	750-2500 kVA Low-Voltage Ratings 208Y/120, 240 480Y/277, 480 (V)
2400	45	4–2-1/2%	2–2-1/2%	2–2-1/2%	2520/2460/2340/2280
4160	60	4–2-1/2%	2–2-1/2%	2–2-1/2%	4360/4260/4055/3950
4800	60	4–2-1/2%	2–2-1/2%	2–2-1/2%	5040/4920/4680/4560
7200	75	4–2-1/2%	2–2-1/2%	2–2-1/2%	7560/7380/7020/6840
12 000	95	4–2-1/2%	2–2-1/2%	2–2-1/2%	12 600/12 300/11 700/11 400
12 470	95	4–2-1/2%	2–2-1/2%	2–2-1/2%	13 090/12 780/12 160/11 850
13 200	95	4–2-1/2%	2–2-1/2%	2–2-1/2%	13 860/13 530/12 870/12 540
13 800	95	4–2-1/2%	*	*	14 400/14 100/13 500/13 200
16 340	95	*	*	*	17 200/16 770/15 910/15 480
22 860 Grd Y/13 200	125	4–2-1/2%	2–2-1/2%	2–2-1/2%	24 003/23 431/22 288/21 717
23 900 Grd Y13 800	125	4–2-1/2%	2–2-1/2%	2–2-1/2%	25 095/24 497/23 302/22 705
24 940 Grd Y/14 400	125	4–2-1/2%	2–2-1/2%	2–2-1/2%	26 187/25 563/24 316/23 693
34 500 Grd Y/19 920	150†	4–2-1/2%	2–2-1/2%	2–2-1/2%	36 225/35 363/33 638/32 775

*Taps are the same as those for 750-2500 kVA ratings (see last column).
†125 kV BIL may be specified with adequate surge protection.

4. Basic Lightning Impulse Insulation Levels and Dielectric Test Levels

4.1 Basic Lightning Impulse Insulation Levels

Basic lightning impulse insulation levels (BILs) shall be in accordance with Tables 2 and 3.

Table 3—Electrical Characteristics of Low-Voltage Terminals and Minimum Electrical Clearances

Low-Voltage Ratings (V)	BIL (kV)	60-Hz Dry 1 min Withstand (kV)	Minimum Clearance, Live Parts to Ground* (in)	Minimum Clearance, Live Parts Phase to Phase* (in)
208Y/120	30	10	1	1
240	30	10	1	1
480Y/277	30	10	1	1
480	30	10	1	1

*These dimensions should be increased whenever possible to allow for ease in making connections by the user.

4.2 Dielectric Test Levels

Dielectric test levels shall be in accordance with the distribution levels specified in Table 4 of IEEE C57.12.00-1987 [3].

5. Impedance Voltage

5.1 Percent Impedance Voltage

The percent impedance voltage, as measured on the rated voltage connection, shall be as follows:

kVA Rating	Percent Impedance Voltage
75	1.00–5.00
112.5–300	1.20–6.00
500	1.50–7.00
750–500	5.75

5.2 Tolerance

The tolerance on impedance voltage shall be as specified in IEEE C57.12.001987 [3].

5.3 Tolerance on a Tap

The percent departure of the tested impedance voltage on any tap from the tested impedance voltage at rated voltage shall not be greater than the total tap voltage range and shall be expressed as a percentage of the rated voltage.

6. Tests

6.1 General

Except as specified in 6.2, tests shall be performed as specified in IEEE C57.12.00-1987 [3] and IEEE C57.12.90-1987 [5].

6.2 Dielectric Test

For wye-wye connected units, the transformer primary is designed for solidly-grounded application, and no applied-potential test is required. The induced-potential test shall be performed by applying, between the terminals of each winding, a voltage of 1000 V plus 3.46 times rated transformer winding voltage, which will develop from the high-voltage line terminal to ground. In no case, however, shall the line-to-ground voltage developed exceed 40 000 V for 125 kV BIL or 50 000 V for 150 kV BIL. For this test, the neutral terminal shall be grounded. However, under conditions in which the neutral terminal ground connection can be removed, both the applied potential test and the induced potential test, as specified in IEEE C57.12.00-1987 [3], may be performed.

7. Construction

7.1 General

A pad-mounted, compartmental-type transformer shall consist of a tank with high-voltage and low-voltage cable terminating compartments, as shown in Fig 3 or Fig 7. The compartments shall be separated by a barrier of metal or other rigid material.

7.1.1

Cabinet security shall be evaluated in accordance with the test procedures and requirements of the design test method for cabinet security described in ANSI C57.12.28-1988 [1].

7.1.2

The high-voltage and low-voltage compartments shall be located side-by-side on one side of the transformer tank. When viewed from the front, the low-voltage compartment shall be on the right.

7.1.3

Each compartment shall have a door that is constructed so as to provide access to the high-voltage compartment only after the door to the low-voltage compartment has been opened. There shall be one or more additional fastening devices that must be removed before the high-voltage door can be opened. Where the low-voltage compartment door is of a fiat panel design, the compartment door shall have three-point latching with a handle provided for a locking device. Hinge pins and associated barrels shall be constructed of corrosion-resistant material, passivated AISI Type 304 or the equivalent.

7.1.4

The transformer tank and compartments shall be so constructed as to limit disassembly, breakage, and prying open of any doors, panels, and sills with the doors in the closed and locked position.

7.1.5

The bottom edges of the compartment shall be so constructed as to provide for the use of hold-down devices that are accessible only from inside the compartments.

7.1.6

Construction of the unit shall be such that it can be lifted, skidded, or slid, or any combination of these, into place on the mounting surface without disturbing the high-voltage or low-voltage cables.

7.1.7

Jack bosses or jacking facilities shall be provided on the tank. The vertical clearance for a jack shall be 1.5 in minimum to 6.5 in maximum.

7.1.8

The transformer shall be arranged for rolling in two directions: parallel to and at right angles to one side of the transformer.

7.1.9

The transformer shall be provided with lifting provisions that are permanently attached and arranged on the tank in such a manner as to provide a distributed balanced lift in a vertical direction for the completely assembled transformer. The transformer shall be designed to provide a safety factor of 5. The safety factor of 5 is the ratio of the ultimate stress of the material used to the working stress. The working stress is the maximum combined stress developed in the lifting provisions by the static load on the completely assembled transformer.

7.2 Connectors and Terminals

7.2.1

The electrical characteristics of the completely assembled high-voltage connectors shall be as shown in Table 4. The electrical characteristics and clearances of the completely assembled low-voltage terminals shall be as shown in Table 3.

Table 4—Transformers and Connectors High-Voltage Ratings and Electrical Characteristics

Transformer		Electrical Characteristics of Completely Assembled High-Voltage Connectors*			
		High-Voltage Ratings			
High-Voltage Ratings (V)	BIL (kV)	Phase to Ground (kV)	Phase to Ground/ Phase to Phase (kV)	BIL (kV)	60 Hz Dry 1 min Withstand (kV)
2400	45	8.3	8.3/14.4	95	34
4160 to 4800	60	8.3	8.3/14.4	95	34
7200	75	8.3	8.3/14.4	95	34
12 000 to 16 340	95	8.3 or 15.2†	8.3/14.4 or 15.2/26.3†	95 or 125†	34 or 40†
22 860 Grd Y to 24 940 Grd Y	125	15.2	15.2/26.3	125	40
34 500 Grd Y	150‡	21.1	21.1/36.6	150	50

*For complete connector ratings, see IEEE 386-1985 [8].
†Required connector rating should be specified.
‡When specifying 125 kV BIL, adequate grounding and surge protection studies should be made.

7.2.2

The number, location, and arrangement of the high-voltage connectors and low-voltage terminals shall be as shown in Figs 1–4 or Figs 5–8.

7.2.3

High-voltage connectors shall be provided for connection to the distribution system through separable insulated high-voltage connectors. The high-voltage connectors shall consist of either bushing wells, bushing wells with bushing inserts, or integral bushings, as specified. Cable accessory parking stands shall be provided. For specific details concerning high-voltage separable connectors and cable accessory parking stands, refer to IEEE 386-1985 [8]. Separable insulated high-voltage connectors that are designed for operation after the transformer is in place shall be located so that they can be operated with hot-line tools.

All high-voltage connectors shall be field replaceable utilizing the access provided or through removal of the cover.

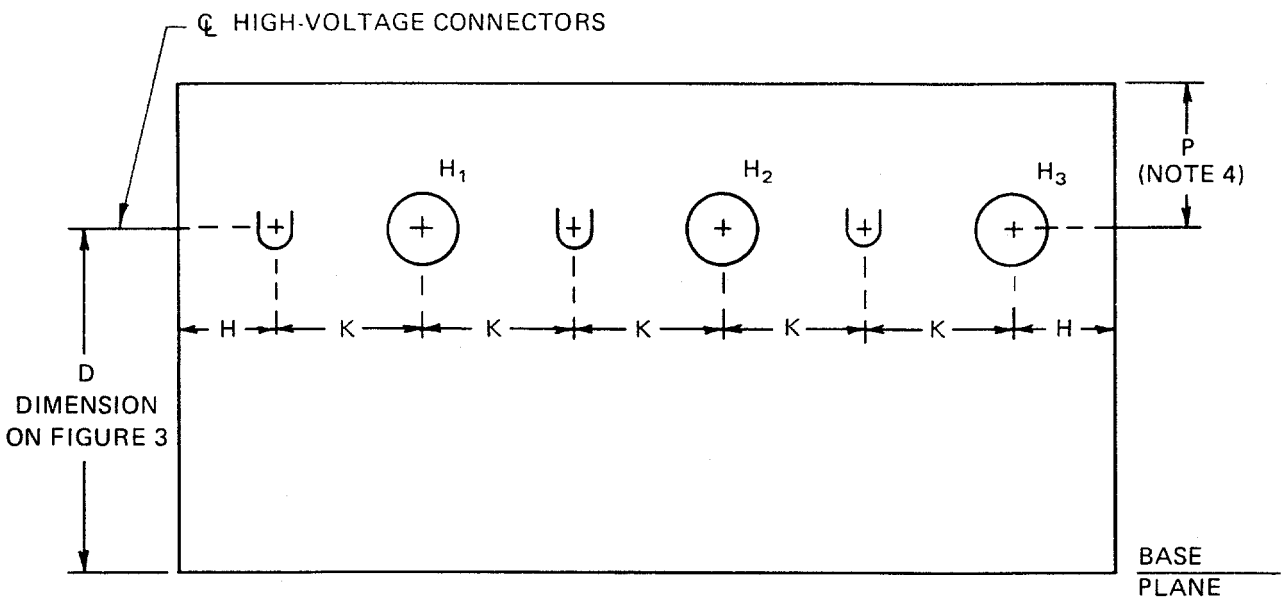
7.2.4

When provided, the high-voltage neutral bushing may be two insulation classes below that of the phase bushings.

7.2.5

Low-voltage line and neutral terminals shall be in accordance with Figs 4(a), 4(b), 8(a), or 8(b) and shall be arranged for vertical takeoff. Terminal dimensions shall be as shown in Figs 9(a), 9(b), 9(c), or 9(d), as specified.

All low-voltage bushings shall be replaceable utilizing the access provided or through the removal of the cover.



kVA Ratings	Separable Insulated Connectors with High-Voltage Ratings of								
	8.3 and 8.3/14.4 kV			15.2 and 15.2/26.3 kV			21.1 and 21.1/36.6 kV		
	H	K	P	H	K	P	H	K	P
75–150	2.3	4.0	4.5	2.9	4.0	4.5	4.0	6.0	7.5
225–500	3.0	4.0	4.5	3.0	4.0	4.5	4.0	6.0	7.5
750–2500	3.2	4.0	4.5	3.2	4.0	4.5	4.0	6.0	7.5

NOTES: (1) High-voltage connector arrangements and dimensions are for applications requiring certain minimum dimensions.

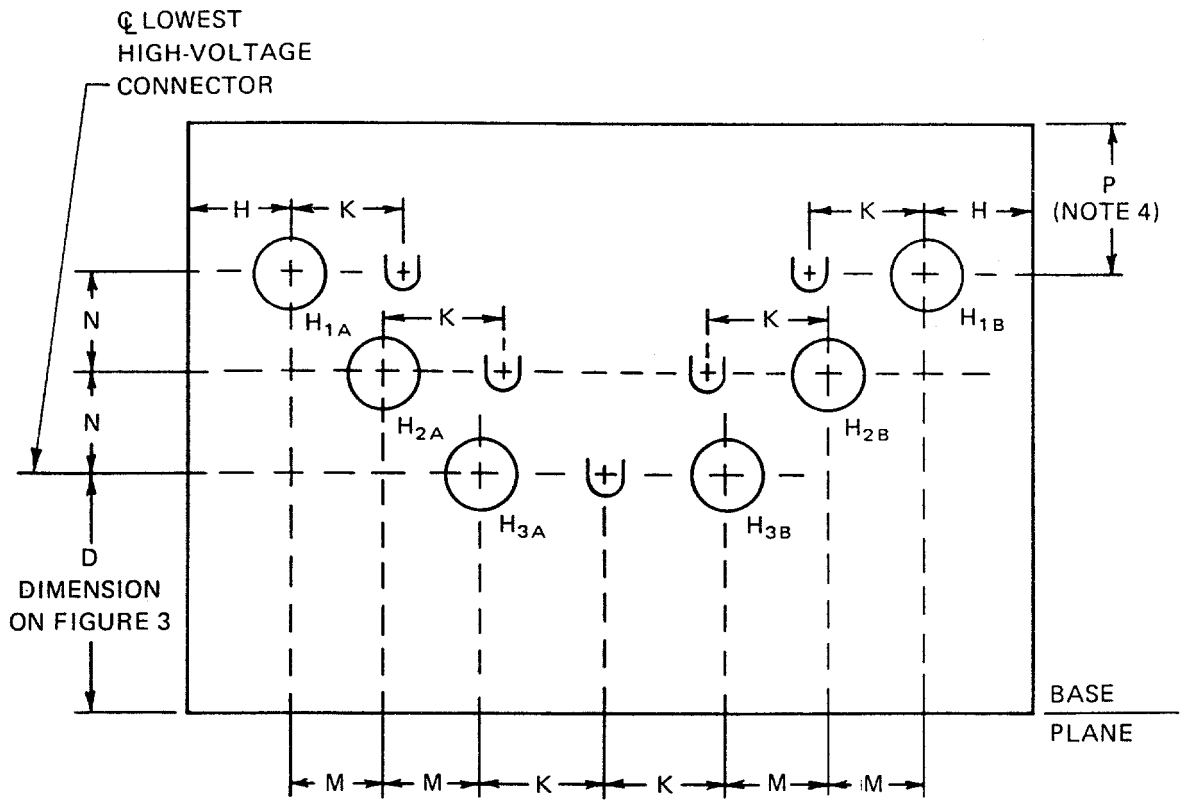
(2) All dimensions are in inches and are minimum.

(3) The above minimum dimensions do not provide for all types of parking-stand-mounted devices.

(4) For bail clearances, when specified, P = 11.0 in for 8.3/14.4 kV connectors, 14.0 in for 15.2 kV and 15.2/26.3 kV connectors, and 17.0 in for 21.1 kV and 21.1/36.6 kV connectors.

(5) Configuration for 21.1/36.6 kV connectors is based on IEEE 386-1985 [8], Fig 7, designation interface for separable insulated connectors.

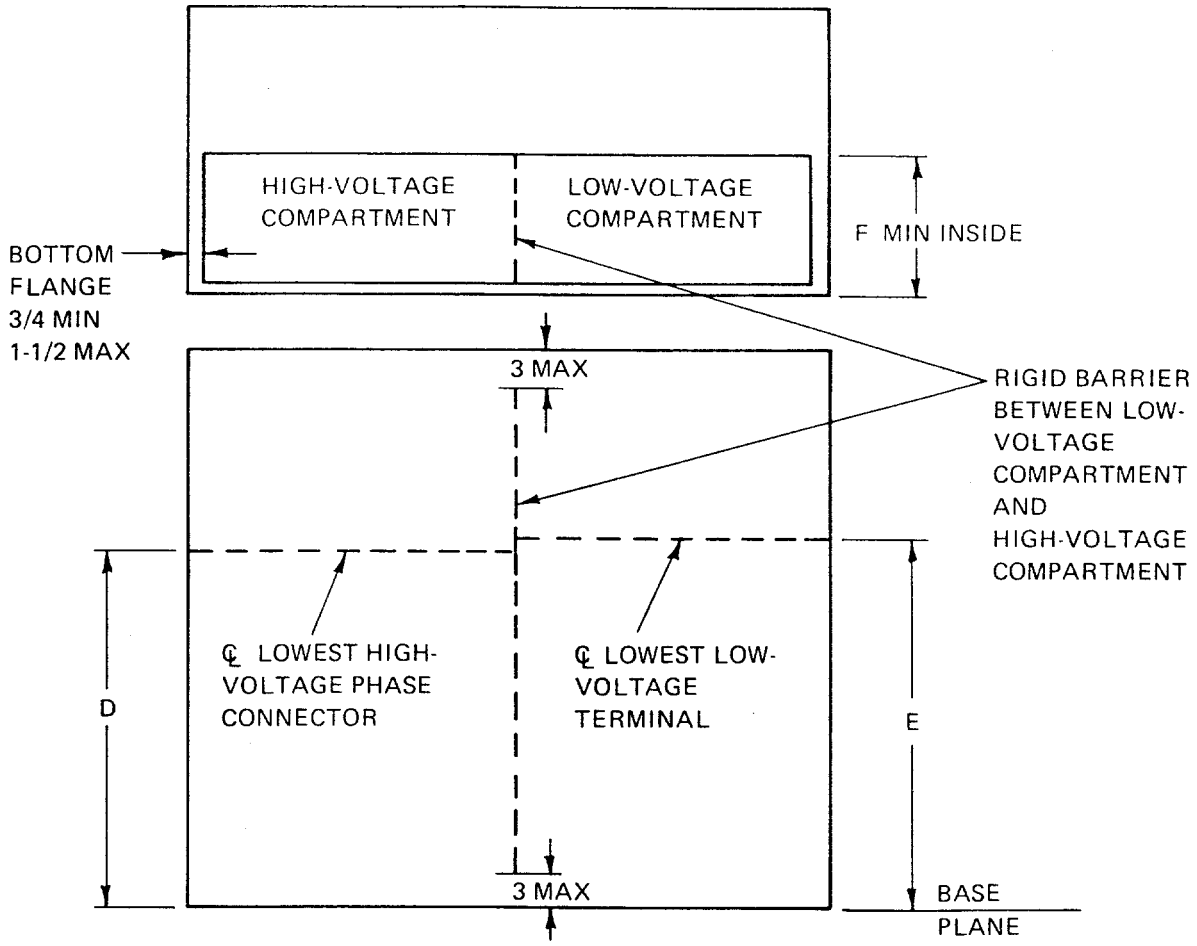
Figure 1—Minimum Dimensions for Radial-Feed Transformers



kVA Ratings	Separable Insulated Connectors with High-Voltage Ratings of														
	8.3 and 8.3/14.4 kV					15.2 and 15.2/26.3 kV					21.1 and 21.1/36.6 kV				
	H	N	M	K	P	H	N	M	K	P	H	N	M	K	P
All	3.0	4.0	3.0	4.0	4.5	3.0	4.0	3.5	4.5	4.5	4.0	4.0	3.75	6.0	7.5

NOTES: (1) High-voltage connector arrangements and dimensions are for applications requiring certain specific dimensions.
(2) All dimensions are in inches and are minimum.
(3) The above minimum dimensions do not provide for all types of parking-stand-mounted devices.
(4) For bail clearances, when specified, P = 11.0 in for 8.3/14.4 kV connectors, 14.0 in for 15.2 kV and 15.2/26.3 kV connectors, and 17.0 in for 21.1 kV and 21.1/36.6 kV connectors.
(5) Configuration for 21.1/36.6 kV connectors is based on IEEE 386-1985 [8], Fig 7, designation interface for separable insulated connectors.

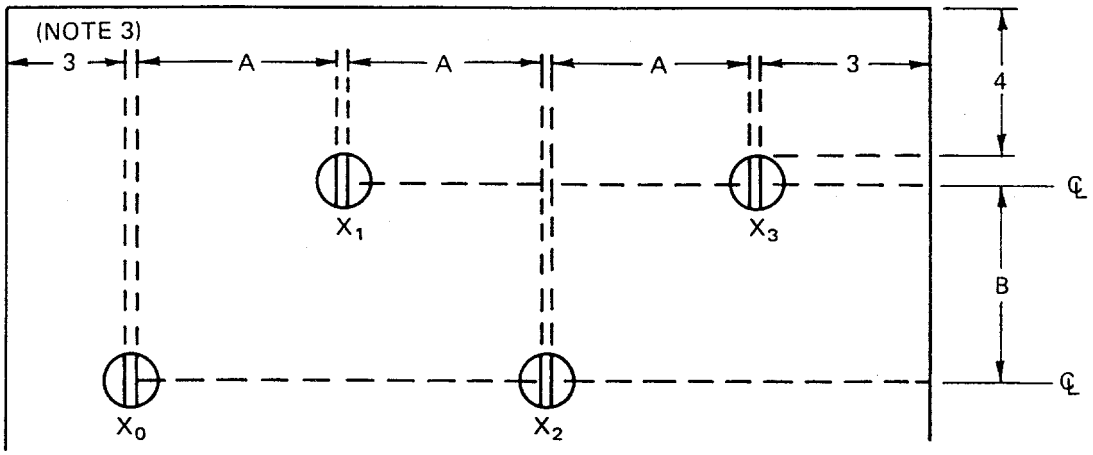
Figure 2—Minimum Dimensions for Loop-Feed Transformers



kVA Ratings	Low-Voltage Ratings (volts)	Separable Insulated Connectors with High-Voltage Ratings of: 8.3 or 15.2 kV D	E	F	21.1 kV D	E	F
75–500	All	21	20	18	21	20	21
750–1000	240, 208Y/120	27	27	18	27	27	21
750–2500	480, 480Y/277	27	27	18	27	27	21

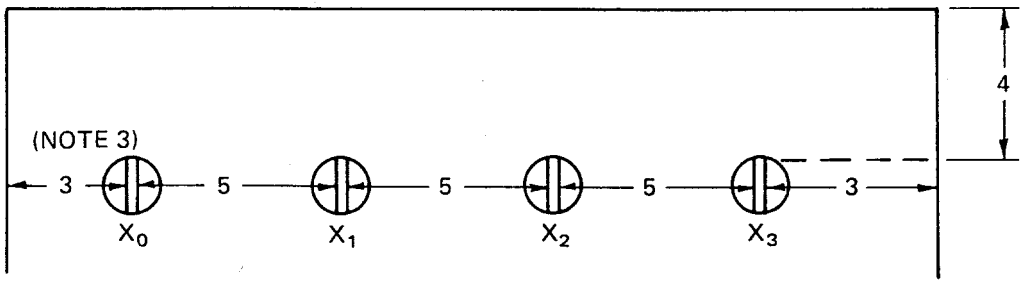
NOTES: (1) High-voltage connector arrangements and dimensions are for applications requiring certain minimum dimensions.
(2) All dimensions are in inches and are minimum unless otherwise specified.

Figure 3—Compartment Designations and Minimum Dimensions for Loop-Feed or Radial-Feed Transformers



kVA Ratings	A	B
75–150	3	6
225–500	4	8
750–2500	5	8

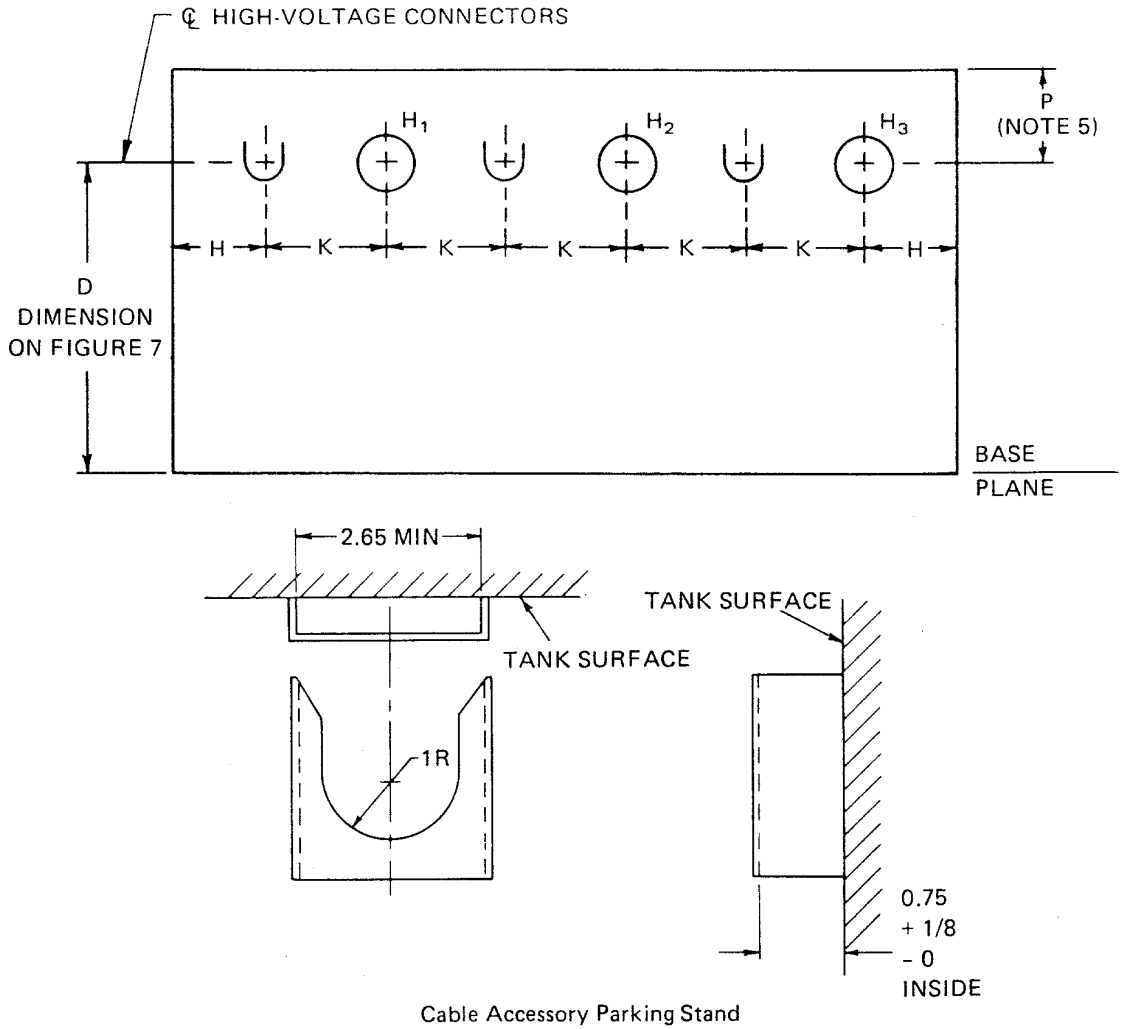
(a) Staggered Low-Voltage Terminal Arrangement



(b) In-Line Low-Voltage Terminal Arrangement

NOTES: (1) Low-voltage terminal arrangements and dimensions are for applications requiring certain minimum dimensions.
(2) All dimensions are in inches and are minimum.
(3) This is the dimension to the rigid barrier between the high-voltage compartment and the low-voltage compartment.

Figure 4—Low-Voltage Terminal Arrangements and Minimum Dimensions



Cable Accessory Parking Stand

kVA Ratings	Separable Insulated Connectors with High-Voltage Ratings of								
	8.3 and 8.3/14.4 kV			15.2 and 15.2/26.3 kV			21.1 and 21.1/36.6 kV		
	H	K	P	H	K	P	H	K	P
All	3.5	5.0 or 6.5	4.5	4.5	6.5	4.5	5.0	7.0	7.5

NOTES: (1) High-voltage connector arrangements and dimensions are for applications requiring certain specific dimensions.

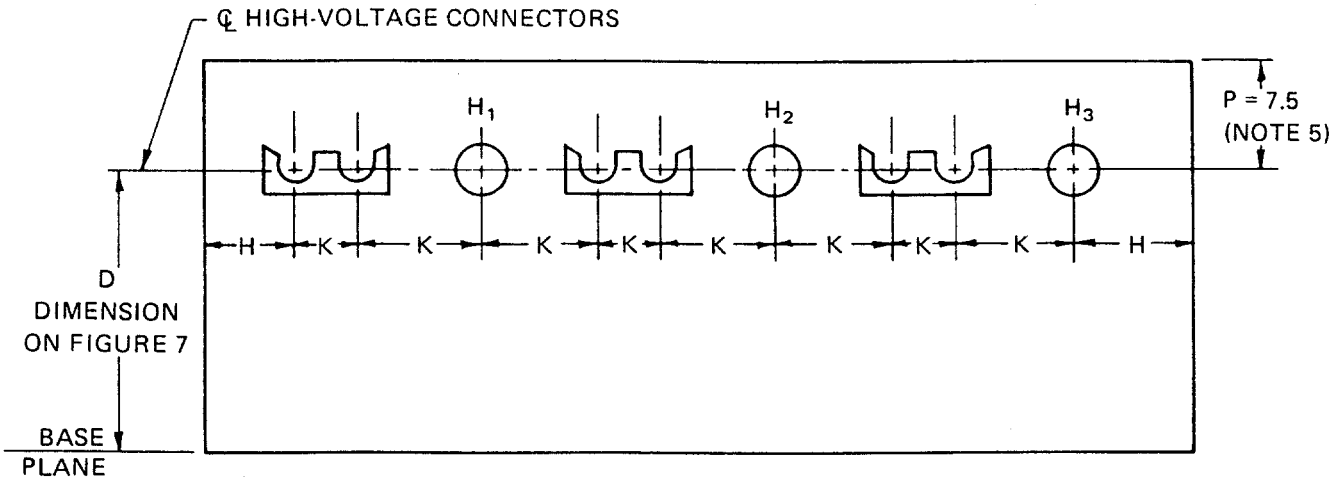
(2) Configuration of 21.1 kV and 21.1/36.6 kV connectors is based on IEEE Std 386-1985 [8], Fig 7, designation interface for separable insulated connectors.

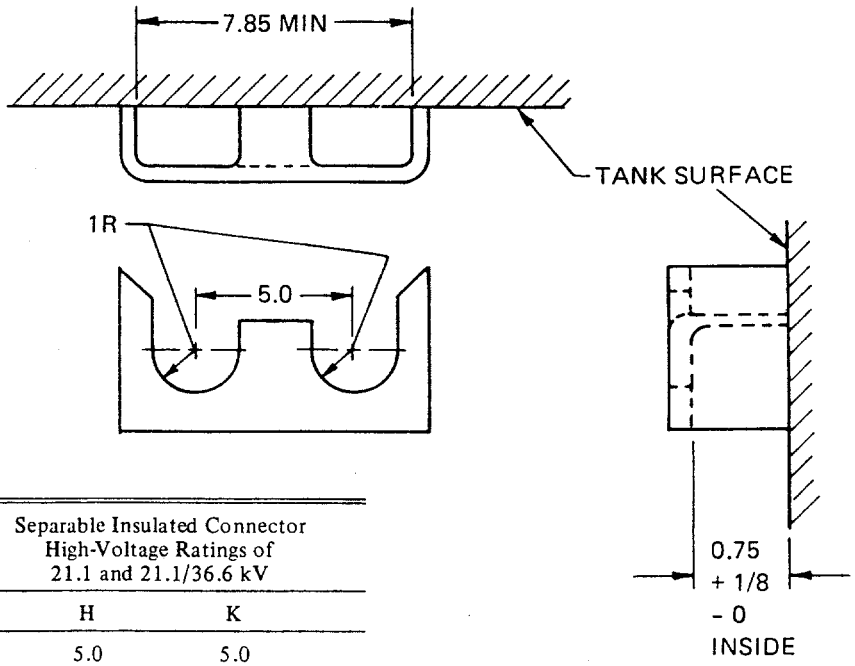
(3) All dimensions are in inches.

(4) H and P are minimum dimensions. Dimension K has a tolerance of ±0.25 in.

(5) For bail clearances, when specified, P = 11.0 in for 8.3/14.4 kV connectors, 14.0 in for 15.2 kV and 15.2/26.3 kV connectors, and 17.0 in for 21.1 kV and 21.1/36.6 kV connectors.

Figure 5.A—Specific Dimensions for Radial-Feed Dimensions





kVA Ratings	Separable Insulated Connector High-Voltage Ratings of 21.1 and 21.1/36.6 kV	
	H	K
All	5.0	5.0

NOTES: (1) High-voltage connector arrangements and dimensions are for applications requiring certain specific dimensions.

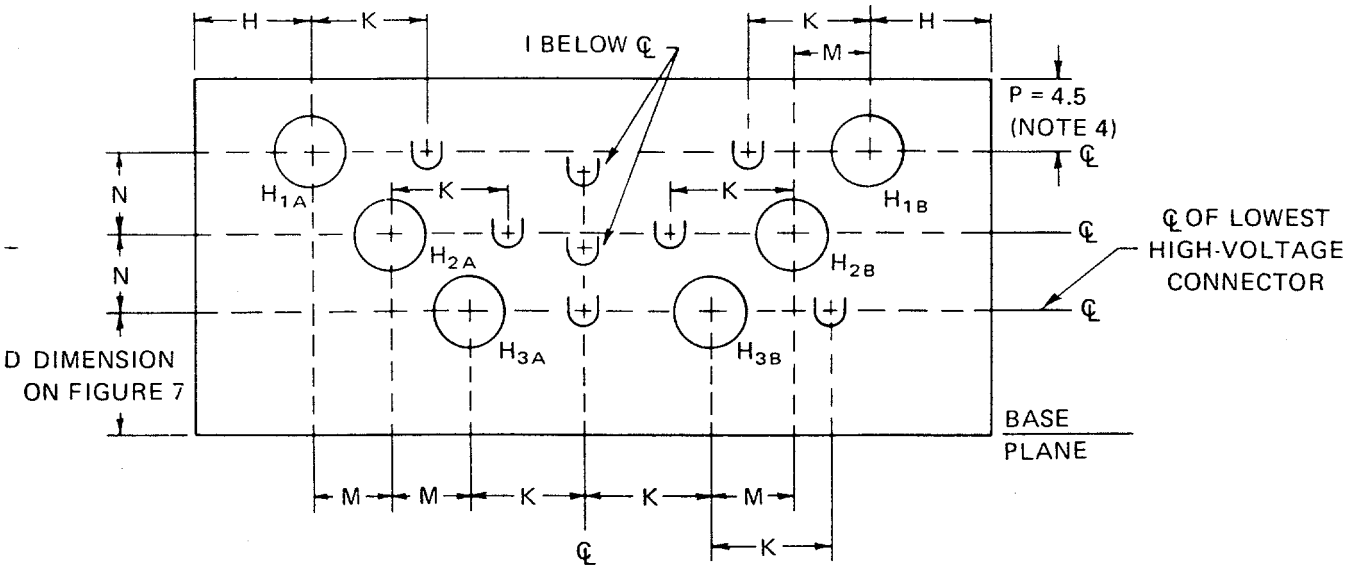
(2) Configuration of 21.1 kV and 21.1/36.6 kV connectors is based on IEEE Std 386-1985 [8], Fig 8, designation interface.

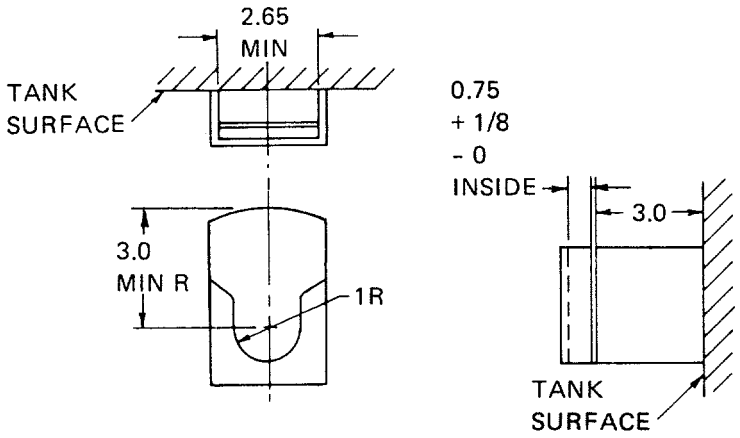
(3) All dimensions are in inches.

(4) H and P are minimum dimensions. Dimension K has a tolerance of ±0.25 in.

(5) For bail clearances, when specified, P = 20.0 in for 21.1 kV and 21.1/36.6 kV connectors.

Figure 5.B—Specific Dimensions for Radial-Feed Transformers



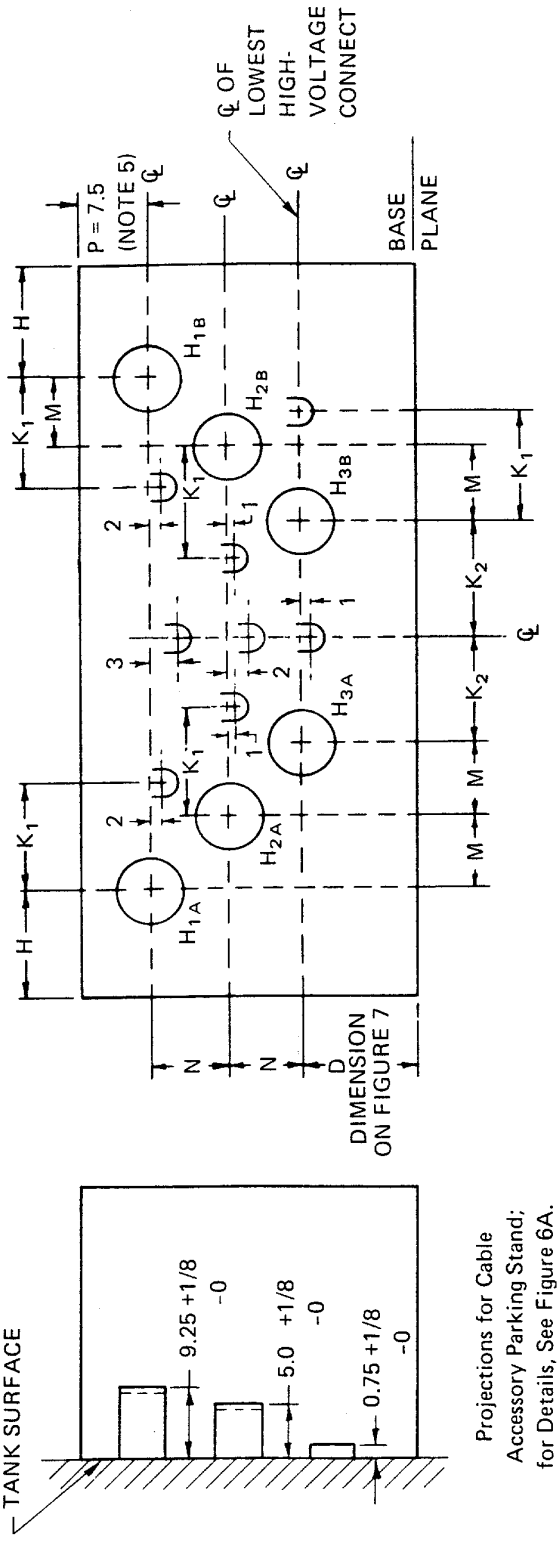


Cable Accessory
Parking Stand

kVA Ratings	Separable Insulated Connectors with High-Voltage Ratings of							
	8.3 and 8.3/14.4 kV				15.2 and 15.2/26.3 kV			
	H	N	M	K	H	N	M	K
All	3.5	6.0	4.5	5.0 or 6.5	4.5	6.0	4.5	6.5

NOTES: (1) High-voltage connector arrangements and dimensions are for applications requiring certain specific dimensions.
(2) All dimensions are in inches.
(3) H and P are minimum dimensions. Dimension K, M, and N have a tolerance of ±0.25 in.
(4) For bail clearances, when specified, P = 11.0 in for 8.3/14.4 kV connectors and 14.0 in for 15.2 kV and 15.2/26.3 kV connectors.

Figure 6.A—Specific Dimensions for Loop-Feed Transformers

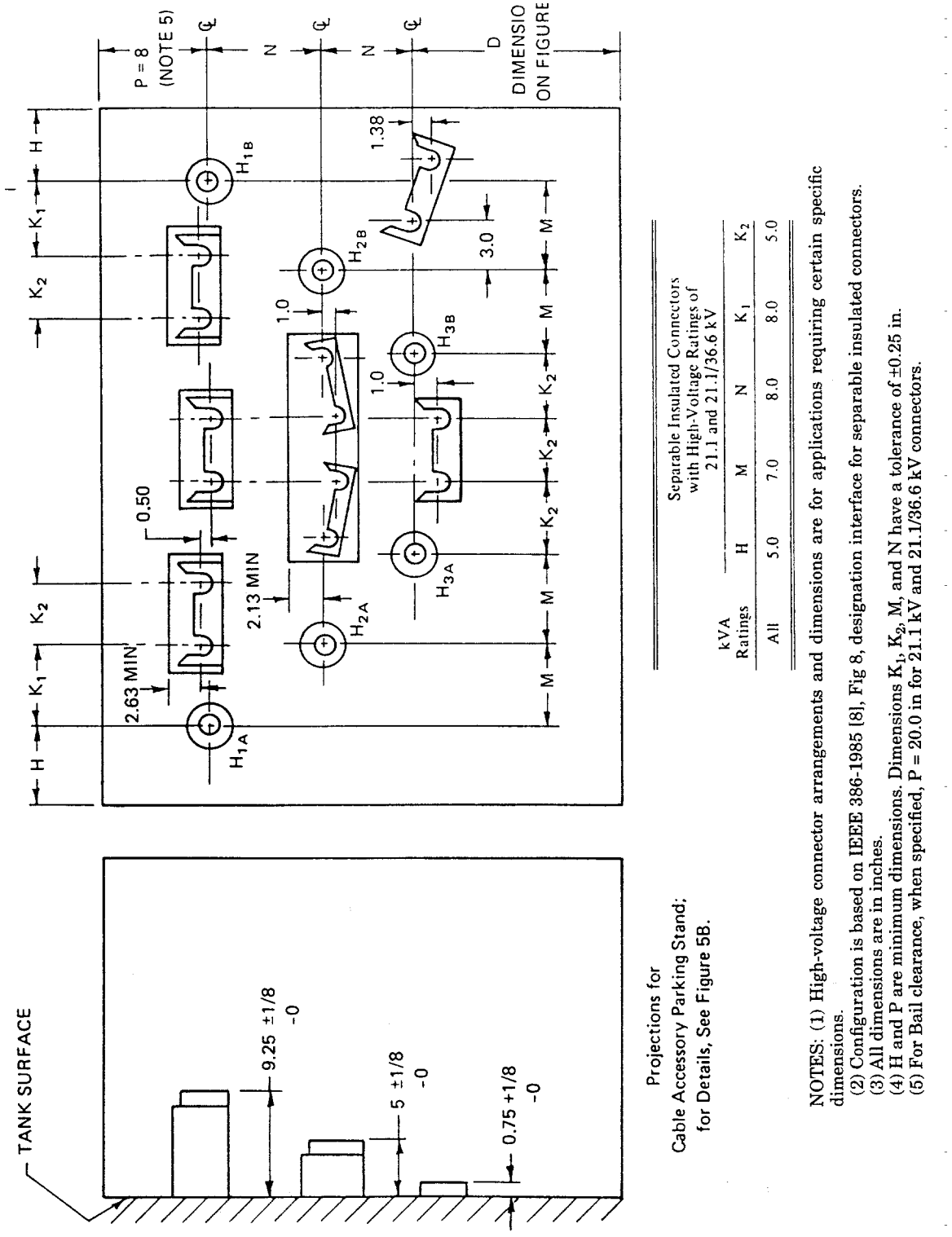


Separable Insulated Connectors with High-Voltage Ratings of 21.1 and 21.1/36.6 kV

kVA Ratings	H	M	N	K_1	K_2
All	5.0	7.0	8.0	9.0	7.5

NOTES: (1) High-voltage connector arrangements and dimensions are for applications requiring certain specific dimensions.
(2) Configuration is based on IEEE 386-1985 [8], Fig 7, designation interface for specific insulated connectors.
(3) All dimensions are in inches.
(4) H and P are minimum dimensions. Dimensions K_1, K_2, M, and N have a tolerance of ±0.25 in.
(5) For Bail clearance, when specified, P = 17.0 in for 21.1 kV and 21.1/36.6 kV connectors.

Figure 6.B—Specific Dimensions for Loop-Feed Transformers

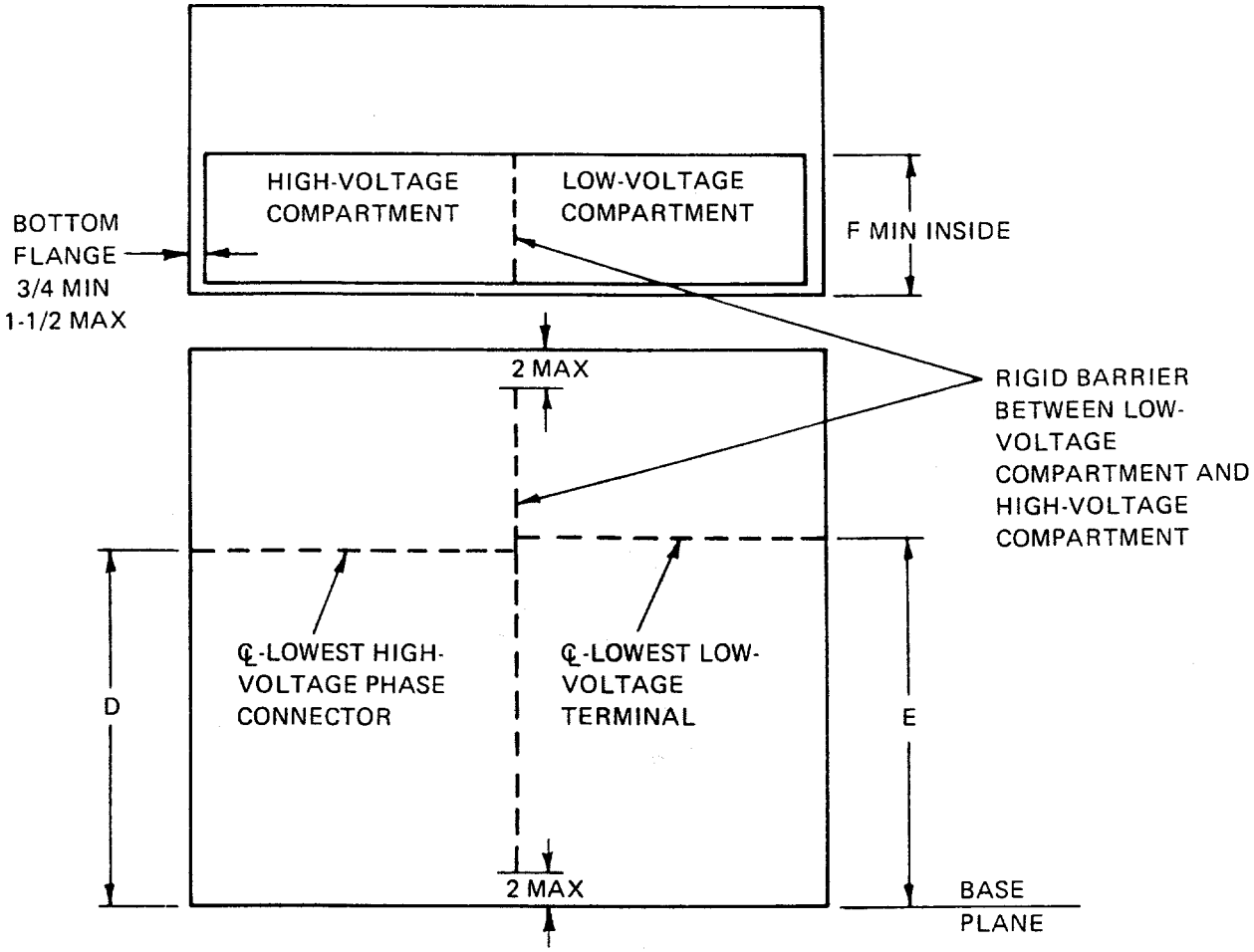


Separable Insulated Connectors with High-Voltage Ratings of 21.1 and 21.1/36.6 kV

kVA Ratings	H	M	N	K_1	K_2
All	5.0	7.0	8.0	8.0	5.0

NOTES: (1) High-voltage connector arrangements and dimensions are for applications requiring certain specific dimensions.
(2) Configuration is based on IEEE 386-1985 [8], Fig 8, designation interface for separable insulated connectors.
(3) All dimensions are in inches.
(4) H and P are minimum dimensions. Dimensions K_1, K_2, M, and N have a tolerance of ±0.25 in.
(5) For Bail clearance, when specified, P = 20.0 in for 21.1 kV and 21.1/36.6 kV connectors.

Figure 6.C—Specific Dimensions for Loop-Feed Transformers



	Separable Insulated Connectors with High-Voltage Ratings of						
	8.3 or 15.2 kV			21.1 and 21.1/36.6 kV			
						F (Note 4)	
kVA Ratings	D	E	F (Note 3)	D	E	Figure 4 Interface	Figure 5 Interface
75–150	27	27	18	27.0	27.0	24.0	30.0
225–500	27	31	18	27.0	31.0	24.0	30.0
750–2500	27	46	18	27.0	46.0	24.0	30.0

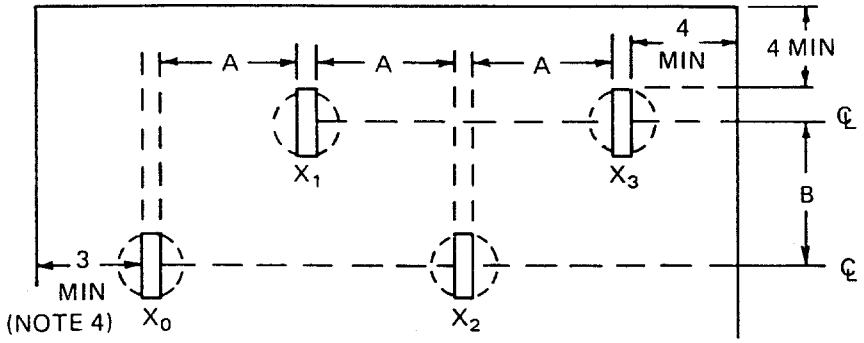
NOTES: (1) High-voltage connector arrangements and dimensions are for applications requiring certain specific dimensions.

(2) All dimensions are in inches. Tolerance on dimensions D and E is ±0.5 in.

(3) Transformers conforming to Fig 6, using 15.2 kV connectors, require a minimum depth of 19.0 in at the elevation at the parking stands.

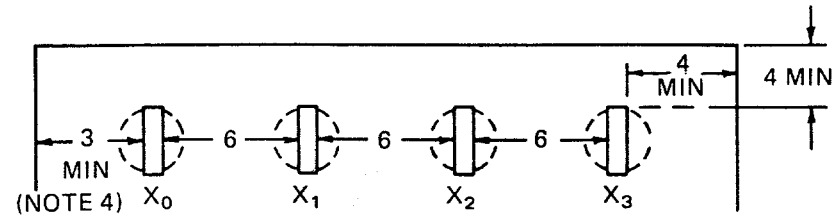
(4) Dimensions are based on IEEE Std 386-1985 [8], Figs 7 and 8, interface for separable connectors.

Figure 7—Compartment Designations and Specific Dimensions for Loop-Feed and Radial-Feed Transformers



kVA Ratings	A	B
75–150	5	6
225–2500	6	8

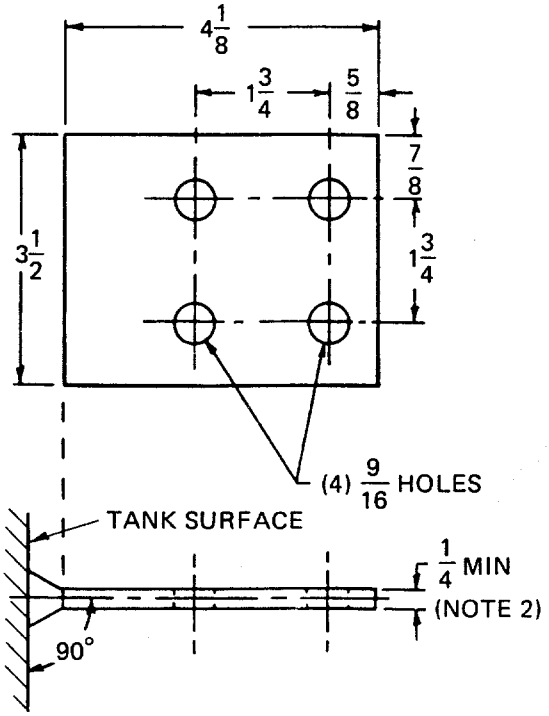
(a) Staggered Low-Voltage Terminal Arrangement



(b) In-Line Low-Voltage Terminal Arrangement

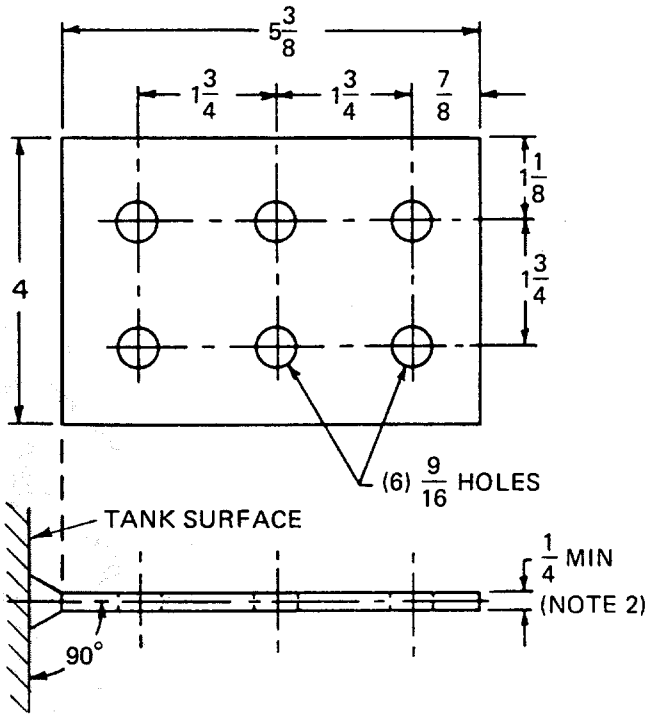
NOTES: (1) Low-voltage terminal arrangements and dimensions are for applications requiring certain specific dimensions.
(2) All dimensions are in inches.
(3) Tolerance on all dimensions is ±0.25 in, unless otherwise specified.
(4) Dimensions are to rigid barrier between high-voltage compartment and low-voltage compartment.

Figure 8—Low-Voltage Terminal Arrangements and Specific Dimensions



kVA Ratings	Low-Voltage Ratings (volts)
75–300	208Y/120
75–500	240
75–500	480, 480Y/277

(*a*)

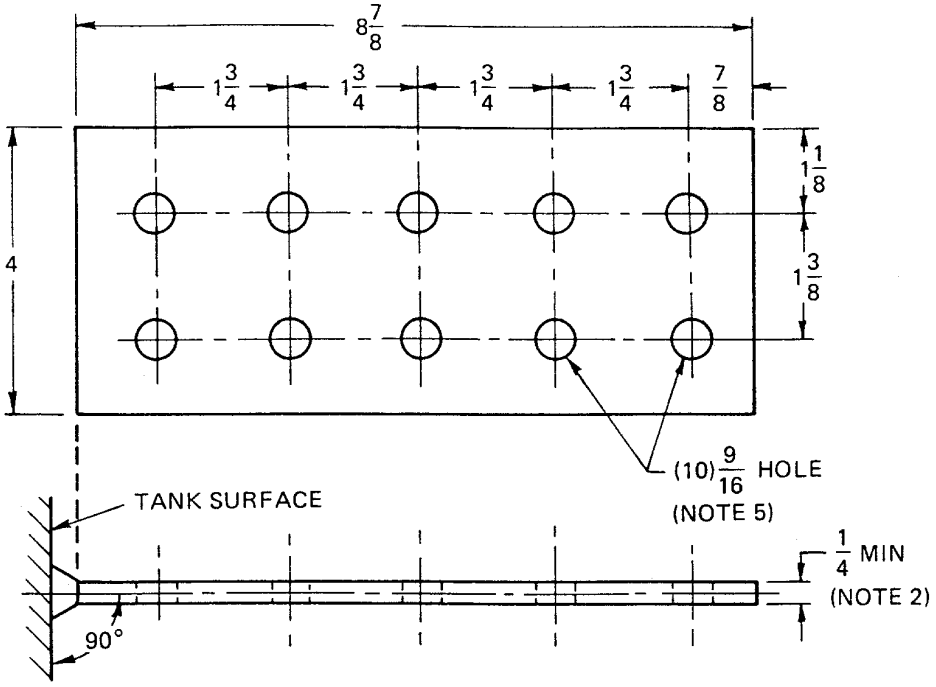


kVA Ratings	Low-Voltage Ratings (volts)
500	208Y/120
750	240
750–1500	480, 480Y/277

(*b*)

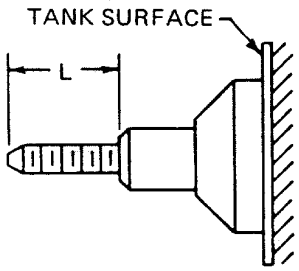
NOTES: (1) All dimensions are in inches unless otherwise specified.
(2) Greater thickness may be required.
(3) Larger thread size or length, or both, may be required if materials other than copper are used.
(4) Terminals a, b, and c are normally supplied; terminal d is supplied only when specified.
(5) To be furnished with additional support, designed by the manufacturer, at the end furthest from the tank wall without interfering with the use of any of the ten holes.

Figure 9—Low-Voltage Terminals



kVA Ratings	Low-Voltage Ratings (volts)
750–1000	208Y/120
1000	240
2000–2500	480, 480Y/277

(*c*)



kVA Ratings	Low-Voltage Ratings (volts)	Thread Size (Note 3)	Minimum L (Note 3)
75–150	240, 208Y/120	5/8–11 UNC-2A	1.25
75–300	480, 480Y/277	5/8–11 UNC-2A	1.25
225–300	240, 208Y/120	1–14 UNS-2A	1.75
500	480, 480Y/277	1–14 UNS-2A	1.75
500	240, 208Y/120	1-1/4–12 UNF-2A	2.62

(*d*)

Figure 9—Low-Voltage Terminals (continued)

7.2.6

The low-voltage neutral shall be either a blade connected directly to the tank or a fully-insulated terminal. If a fully-insulated terminal is used, a ground pad shall be provided on the outer surface of the tank. One or more removable ground straps, suitably sized for the short-circuit rating of the transformer, as defined in IEEE C57.12.00-1987 [3], shall be provided and connected between the low-voltage neutral terminal and the ground.

7.2.7

For wye-wye connected units, the high-voltage neutral shall be connected to the low-voltage neutral internally, with provision for the opening of this connection for testing.

7.2.8

Connector and terminal designations shall be as defined in ANSI C57.12.70-1978 [2]. The high-voltage connector and low-voltage terminal designations and locations shall be as shown in Figs 1-4 or Figs 5-8.

The identification of connector and terminal connections shall be as shown on the instruction nameplate.

7.2.9

The angular displacement shall be as shown in Fig 10.

7.3 High-Voltage and Low-Voltage Compartments

The compartment doors shall be of sufficient size to provide adequate operating and working space when removed or open. The doors shall be either equipped for latching in the open position or designed for manual removal.

7.4 Instruction Nameplate

7.4.1

The instruction nameplate shall be located in the low-voltage compartment and shall be readable with the cables in place. Where the nameplate is mounted on a removable part, the manufacturer’s name and the transformer’s serial number shall be permanently affixed to a nonremovable part.

7.4.2

The nameplate information shall conform to IEEE C57.12.00-1987 [3], i.e., nameplate A for 500 kVA and below and nameplate B for 750 kVA and above. The high-voltage BIL shall be included on the nameplate.

7.5 Oil Preservation

7.5.1

Transformers shall be of sealed-tank construction. Sealed-tank construction is a construction that seals the interior of the tank from the atmosphere and in which the gas volume plus the oil volume remain constant. The transformer shall remain effectively sealed for a top-oil temperature range of −5 °C to +105 °C, continuous, and under the operating conditions described in IEEE C57.91-1981 [6] and IEEE C57.92-1981 [7].

7.5.2

A replaceable valve, to relieve excess pressures, shall be furnished in the low-voltage compartment on the tank wall above the 140 °C top oil level, according to the manufacturer's calculation, and shall be located so as not to interfere with the use of the low-voltage terminals or the operating handle of the low-voltage circuit breaker.

The inlet port shall be 0.25 in or larger NPT (or NF thread with gasket), and shall be sized for a specified minimum flow rate.

Exposed parts shall be of weather- and corrosion-resistant materials.

Gaskets and O-rings shall withstand oil vapor and 105 °C temperature, continuous, under the operating conditions described in IEEE C57.91-1981 [6] and IEEE C57.92-1981 [7] without seizing or deteriorating for the life of the transformer.

The valve shall have a pull ring for manually reducing pressure to atmospheric using a standard hookstick, and shall be capable of withstanding a static pull force of 25 lb for 1 min without permanent deformation. The valve shall withstand a static force of 100 lb for 1 min applied normally to its longitudinal axis at the outmost extremity of the body.

When specified, the venting port on the outward side of the valve head seat shall be protected to prevent entry of dust, moisture, and insects before and after the valve has been actuated; or a weather-cap-type indicator shall be provided that will remain attached to the valve and provide positive indication to an observer that the valve has operated. Venting and sealing characteristics shall be as follows:

Cracking pressure: 10 psig ± 2 psig
Resealing pressure: 6 psig minimum
Leakage from resealing pressure to –8 psig: 0
Flow at 15 psig: 35 SCFM minimum*

*SCFM is flow in cubic feet per minute, corrected for an air pressure of 14.7 psi and an air temperature of 21.1 °C

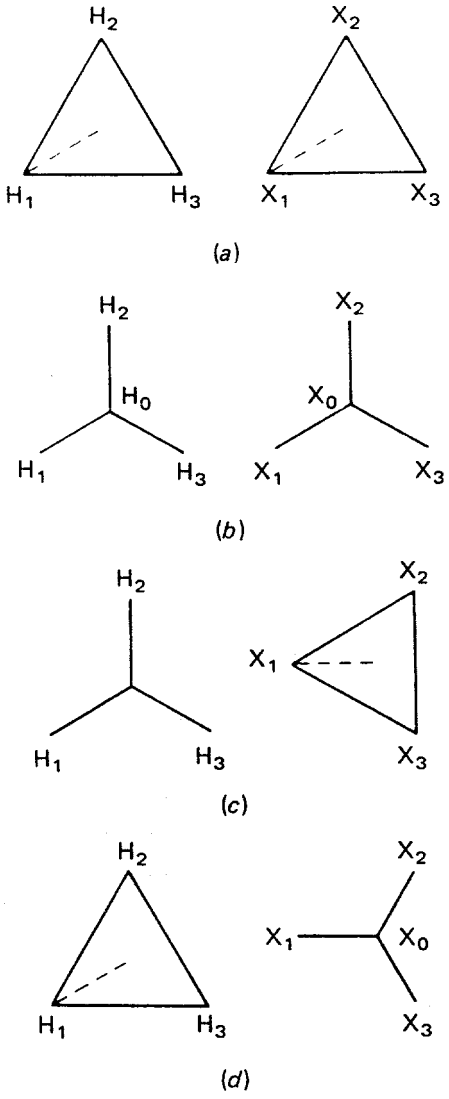


Figure 10—Angular Displacement

7.6 Tanks

7.6.1

The transformer tank shall be of sufficient strength to withstand an internal static pressure of 7 psig without permanent distortion and 15 psig without rupturing or displacing components of the transformer or affecting cabinet security as described in 7.1.1. The manufacturer shall certify that design tests have been made on representative samples. A one inch upper plug (or cap) for filling and pressure testing shall be provided. A one inch NPT drain valve with a built-in sampling device shall be provided. Both the filling plug or cap and the drain valve shall be located within the low-voltage termination compartment.

7.6.2

Where internal connections for test purposes or an internal tap changer are required, access shall be provided.

7.6.3

Where a removable cover of any kind is used, the construction shall conform to 7.1.

7.6.4

The tank ground provision shall consist of the following pads:

1) *500 kVA and below:* two steel pads, each with a 1/2-13 UNC tapped hole, 7/16 in deep.
2) *Above 500 kVA:* two unpainted, copper-faced steel or stainless steel pads, 2 × 3.5 in each, with two holes spaced on 1.75 in centers and tapped for 1/2-13 UNC thread. The minimum thickness of the copper facing shall be 0.015 in. The minimum thread depth of holes shall be 0.5 in.

These ground pads shall be welded on or near the transformer base: one in the high-voltage compartment and one in the low-voltage compartment. In cases in which the transformer tank and compartments are separate, provisions shall be made for electrically bonding them.

7.7 Components for Loop Primary Cable Systems

The minimum current-carrying capabilities of components for looped primary systems shall be 200 A (continuous current rating) and 10 000 amperes rms symmetrical for 0.17 s (short-time current rating) for transformers with or without high-voltage switching.

8. Installation

Equipment manufactured to this specification may be installed in areas in which environmental and climatic conditions make operation at varying angles of tilt from the horizontal an important consideration. Under these circumstances the user may wish to make a particular “angle of tilt” part of the specification.

9. Storage

The transformer shall be stored on its base and shall remain essentially in that position at all times, including during transport to the site and during installation.